Citation:

Hall AJ, Bixler D, Helmkamp JC, Kraner JC, Kaplan JA. Fatal all-terrain vehicle crashes: injury types and alcohol use. *Am J Prev Med.* 2009 Apr;36(4):311-6. Epub 2009 Feb 7.

PubMed ID: 19201149

Study Design:

Retrospective Cohort Study

Class:

B - Click here for explanation of classification scheme.

Research Design and Implementation Rating:

NEUTRAL: See Research Design and Implementation Criteria Checklist below.

Research Purpose:

- A comprehensive assessment was conducted of ATV fatalities to provide critical guidance for community interventions and public health policy to prevent further deaths.
- To describe the types of injuries resulting in death as a function of traffic versus nontraffic ATV crashes from 2004 to 2006.
- Also evaluated were alcohol and drug use patterns as well as helmet use after enactment of the law.

Inclusion Criteria:

- Death certificates from 2004 to 2006 with ICD-10 codes correlated to ATV crashes
- Traffic crashes were defined as those occurring on a public highway, while nontraffic crashes were those occurring entirely in any place other than a public highway
- Only those decedents involved in crashes that occurred in West Virginia were included

Exclusion Criteria:

None specifically mentioned.

Description of Study Protocol:

Recruitment

In 2007, cases were identified by searching the electronic database of vital records at the Health Statistics Center of the West Virginia Department of Health and Human Resources for death certificates from 2004 to 2006 with ICD-10 codes correlated to ATV crashes.

Design: Retrospective cohort study

Blinding used (if applicable): not applicable

Intervention (if applicable): not applicable

Statistical Analysis

- Decedent characteristics and crash circumstances were stratified by crash class (i.e. traffic or nontraffic) and blood alcohol concentration
- Associations between two dichotomous variables were measured by using exact chi-square test with calculation of odds ratio and corresponding 95% confidence intervals
- Multiple categories of a given variable were tested by using the Mantel-Haenszel chi-square test for trend
- To evaluate different crash and injury types, hierarchical classification schemes were used during the abstraction of OCME records

Data Collection Summary:

Timing of Measurements

Retrospective review of death certificates, death scene investigation reports and toxicologic test results.

Dependent Variables

- Death as a function of traffic versus nontraffic ATV crashes from 2004 to 2006, ascertained through death certificates
- Death scene investigation reports provided information relating to crash circumstances, including crash location and type, injury type, rider position (driver or passenger) and helmet use

Independent Variables

- Alcohol and drug use patterns
- Toxicologic test results, including reported drug and pharmaceutical metabolite concentrations, were abstracted from OCME postmortem toxicologic test results
- Case specimens are screened for alcohol and other volatile compounds by gas chromatography with flame-ionization detection
- Routinely screened drugs include narcotics (e.g. heroin and opioid analgesics), marijuana, stimulants (e.g. cocaine and amphetamines), depressants (e.g. benzodiazepines and barbiturates), and other drugs (e.g antidepressants and antihistamines).

Control Variables

Description of Actual Data Sample:

Initial N: Original number of death certificates reviewed not described

Attrition (final N): 112 fatal ATV crashes were identified during 2004-2006, 101 (90.2%) male

Age: age range of 8 - 88 years, mean 35 years

Ethnicity: not described

Other relevant demographics:

Anthropometrics

Location: West Virginia

Summary of Results:

Key Findings

- Among all decedents, 54 (48.2%) were involved in traffic crashes
- Nearly all (92%) decedents were the ATV operator, and only 15% were known to have worn helmets
- Among the 54 traffic crashes, collisions (56%) and head injuries (65%) predominated, whereas the majority of 58 nontraffic crashes were rollovers (55%) and were most commonly associated with compression injuries of the thorax and abdomen (36%).
- Toxicologic testing completed on 104 (92.9%) decedents, and of these, 60 (57.7%) were positive for either alcohol or drugs of abuse, including opioid analgesics, diazepam, marijuana, cocaine and methamphetamine
- Regardless of crash class (i.e. traffic versus nontraffic), alcohol was detected in the blood of 51 (49%) decedents, of those, 88% had blood alcohol concentrations >0.08% (mean = 0.17%), West Virginia's legal limit.
- Drugs of abuse were identified in 22 (21%) decedents, including marijuana (11%), opioid analgesics (7%), diazepam (6%), cocaine (2%) and methamphetamine (1%).
- A comparison of decedents with blood alcohol concentrations above and below the legal limit revealed no significant differences by gender, rider position, helmet use, crash type, injury type, or the presence of drugs of abuse
- Age was the only factor to vary significantly with blood alcohol concentration, decedents aged >21 years were 7 times more likely (95% confidence interval: 2.1, 30) to have a blood alcohol concentration >0.08% than those aged < 21 years.

Author Conclusion:

Fatal crash and injury types differ significantly depending on the location of ATV use, although alcohol and drug abuse are frequent risk factors in all types of ATV crashes. In addition to promoting helmet use, interventions are needed to address alcohol use among ATV users.

Reviewer Comments:

Relatively small cohort size, only two years of retrospective review. Blood alcohol concentration not measured in all subjects.

Authors note the following limitations:

- *Use of a hierarchical coding system for determining injury type*
- *Critical denominator data are unavailable for calculations of risk*
- *Generalization of these findings beyond populations and settings similar to those in West*

Virginia may not be appropriate

Research Design and Implementation Criteria Checklist: Primary Research

Relevance Questions		
1.	Would implementing the studied intervention or procedure (if found successful) result in improved outcomes for the patients/clients/population group? (Not Applicable for some epidemiological studies)	N/A
2.	Did the authors study an outcome (dependent variable) or topic that the patients/clients/population group would care about?	Yes
3.	Is the focus of the intervention or procedure (independent variable) or topic of study a common issue of concern to nutrition or dietetics practice?	Yes
4.	Is the intervention or procedure feasible? (NA for some epidemiological studies)	N/A

Validity Questions		
1.	**Was the research question clearly stated?**	Yes
1.1.	Was (were) the specific intervention(s) or procedure(s) [independent variable(s)] identified?	Yes
1.2.	Was (were) the outcome(s) [dependent variable(s)] clearly indicated?	Yes
1.3.	Were the target population and setting specified?	Yes
2.	**Was the selection of study subjects/patients free from bias?**	???
2.1.	Were inclusion/exclusion criteria specified (e.g., risk, point in disease progression, diagnostic or prognosis criteria), and with sufficient detail and without omitting criteria critical to the study?	Yes
2.2.	Were criteria applied equally to all study groups?	Yes
2.3.	Were health, demographics, and other characteristics of subjects described?	Yes
2.4.	Were the subjects/patients a representative sample of the relevant population?	???
3.	**Were study groups comparable?**	Yes
3.1.	Was the method of assigning subjects/patients to groups described and unbiased? (Method of randomization identified if RCT)	Yes
3.2.	Were distribution of disease status, prognostic factors, and other factors (e.g., demographics) similar across study groups at baseline?	Yes

3.3.	Were concurrent controls used? (Concurrent preferred over historical controls.)	N/A
3.4.	If cohort study or cross-sectional study, were groups comparable on important confounding factors and/or were preexisting differences accounted for by using appropriate adjustments in statistical analysis?	Yes
3.5.	If case control or cross-sectional study, were potential confounding factors comparable for cases and controls? (If case series or trial with subjects serving as own control, this criterion is not applicable. Criterion may not be applicable in some cross-sectional studies.)	N/A
3.6.	If diagnostic test, was there an independent blind comparison with an appropriate reference standard (e.g., "gold standard")?	N/A
4.	**Was method of handling withdrawals described?**	Yes
4.1.	Were follow-up methods described and the same for all groups?	Yes
4.2.	Was the number, characteristics of withdrawals (i.e., dropouts, lost to follow up, attrition rate) and/or response rate (cross-sectional studies) described for each group? (Follow up goal for a strong study is 80%.)	Yes
4.3.	Were all enrolled subjects/patients (in the original sample) accounted for?	Yes
4.4.	Were reasons for withdrawals similar across groups?	N/A
4.5.	If diagnostic test, was decision to perform reference test not dependent on results of test under study?	N/A
5.	**Was blinding used to prevent introduction of bias?**	Yes
5.1.	In intervention study, were subjects, clinicians/practitioners, and investigators blinded to treatment group, as appropriate?	N/A
5.2.	Were data collectors blinded for outcomes assessment? (If outcome is measured using an objective test, such as a lab value, this criterion is assumed to be met.)	Yes
5.3.	In cohort study or cross-sectional study, were measurements of outcomes and risk factors blinded?	Yes
5.4.	In case control study, was case definition explicit and case ascertainment not influenced by exposure status?	N/A
5.5.	In diagnostic study, were test results blinded to patient history and other test results?	N/A
6.	**Were intervention/therapeutic regimens/exposure factor or procedure and any comparison(s) described in detail? Were interveningfactors described?**	???
6.1.	In RCT or other intervention trial, were protocols described for all regimens studied?	N/A

6.2.	In observational study, were interventions, study settings, and clinicians/provider described?	Yes
6.3.	Was the intensity and duration of the intervention or exposure factor sufficient to produce a meaningful effect?	???
6.4.	Was the amount of exposure and, if relevant, subject/patient compliance measured?	N/A
6.5.	Were co-interventions (e.g., ancillary treatments, other therapies) described?	N/A
6.6.	Were extra or unplanned treatments described?	N/A
6.7.	Was the information for 6.4, 6.5, and 6.6 assessed the same way for all groups?	N/A
6.8.	In diagnostic study, were details of test administration and replication sufficient?	N/A
7.	**Were outcomes clearly defined and the measurements valid and reliable?**	Yes
7.1.	Were primary and secondary endpoints described and relevant to the question?	Yes
7.2.	Were nutrition measures appropriate to question and outcomes of concern?	Yes
7.3.	Was the period of follow-up long enough for important outcome(s) to occur?	???
7.4.	Were the observations and measurements based on standard, valid, and reliable data collection instruments/tests/procedures?	Yes
7.5.	Was the measurement of effect at an appropriate level of precision?	Yes
7.6.	Were other factors accounted for (measured) that could affect outcomes?	Yes
7.7.	Were the measurements conducted consistently across groups?	Yes
8.	**Was the statistical analysis appropriate for the study design and type of outcome indicators?**	Yes
8.1.	Were statistical analyses adequately described and the results reported appropriately?	Yes
8.2.	Were correct statistical tests used and assumptions of test not violated?	Yes
8.3.	Were statistics reported with levels of significance and/or confidence intervals?	Yes
8.4.	Was "intent to treat" analysis of outcomes done (and as appropriate, was there an analysis of outcomes for those maximally exposed or a dose-response analysis)?	N/A
8.5.	Were adequate adjustments made for effects of confounding factors that might have affected the outcomes (e.g., multivariate analyses)?	???

8.6.	Was clinical significance as well as statistical significance reported?	Yes
8.7.	If negative findings, was a power calculation reported to address type 2 error?	N/A
9.	**Are conclusions supported by results with biases and limitations taken into consideration?**	Yes
9.1.	Is there a discussion of findings?	Yes
9.2.	Are biases and study limitations identified and discussed?	Yes
10.	**Is bias due to study's funding or sponsorship unlikely?**	Yes
10.1.	Were sources of funding and investigators' affiliations described?	No
10.2.	Was the study free from apparent conflict of interest?	Yes